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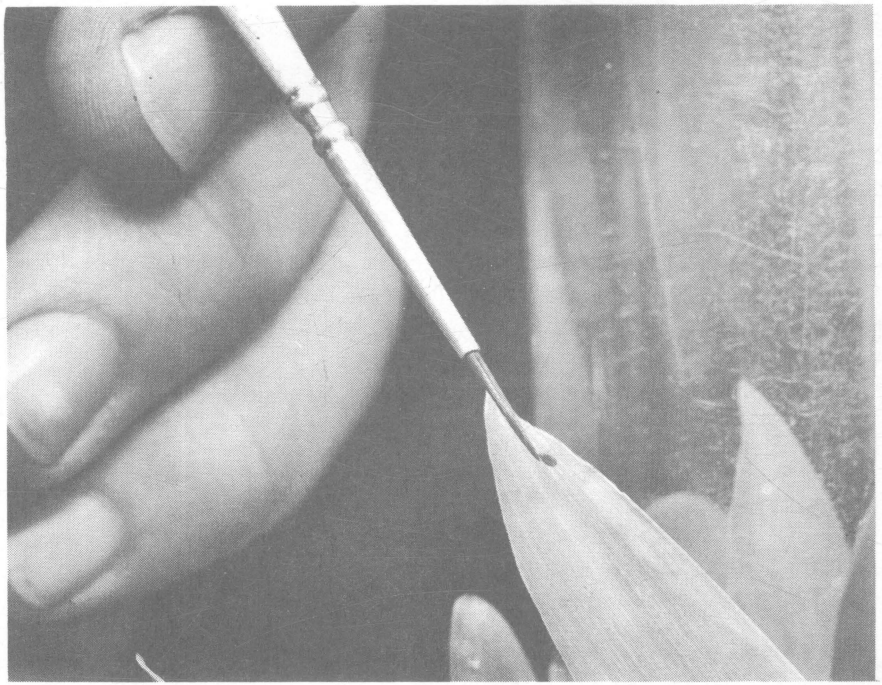

OHIO AGRICULTURAL EXPERIMENT STATION
WOOSTER, OHIO

TRANSMISSION BY THE CORN LEAF APHID, *RHOPALOSIPHUM MAIDIS* (FITCH) OF A VIRUS INFECTING CORN IN OHIO

Warren N. Stoner, Lansing E. Williams, and Leonard J. Alexander[1]

INTRODUCTION

Williams *et al.*[2] of the Ohio Agricultural Experiment Station reported the symptoms of an unidentified virus disease of corn, *Zea mays* L., in June 1964. This report indicated that the virus was recovered from naturally infected corn taken in the field in southern Ohio and that it was then mechanically transmitted to healthy corn seedlings in the greenhouse. Infections of the virus induced leaf mottling in the test plants, as well as striping, chlorosis, and different degrees of stunting. Besides being mechanically transmitted to corn, the virus was also transmitted to teosinte, *Euchlaena mexicana* Schrad; sorghum, *Sorghum vulgare* Pres.; sudangrass, *Sorghum sudanense* (Piper) Stapf; and johnsongrass, *Sorghum halepense* (L.) Pers.

A further report by Williams and Alexander in 1964[3] indicated that symptoms of the disease induced by the virus could be noted as early as 5 days after inoculation, and that the virus had also been recovered from naturally infected johnsongrass. They were also able to produce a high-titre antiserum in rabbits by using a crude substance obtained from one high-speed centrifugation cycle. After three such high-speed cycles, the virus was not infective.

In August, 1964, investigations were initiated cooperatively between the Ohio Agricultural Experiment Station, and the Entomology and Crops Research Divisions of the Agricultural Research Service, USDA, to see whether an insect vector of the virus could be found before the close of the 1964 growing season.

MATERIALS AND METHODS

Insects and plants exhibiting viruslike symptoms were collected in September at the original site of known field infection near Portsmouth, Ohio, and taken to the Experiment Station at Wooster for experimental transmission studies. All test plants had been grown from seed in isolation greenhouses and after manipulation were held in isolation.

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[2]L. E. Williams, L. J. Alexander, E. J. Dollinger, and R. W. Rings. 1964. Symptoms of an unidentified virus disease of corn. Ohio Agricultural Experiment Station, Botany and Plant Pathology Department Series No. 45. 4 pp.

[3]Lansing E. Williams and Leonard J. Alexander. 1964. An unidentified virus isolated from corn in southern Ohio. Phytopathology 54: 912 Abstr.

The virus-susceptible corn line Ohio W-49 was used as the test host. Each 4-inch plastic pot contained four seedlings growing in standard potting soil mixture. Three plants in each pot were used for the insect transmission studies and the fourth was maintained as a control. Soil surface was covered with clean silica sand and test insects were confined on the plants with standard tubular nitro-cellulose cages (Figure 1). Test insects were transferred individually to and from the plants by means of an artist's brush. Each test lot of insects was preserved and labeled for later taxonomic determination[4]. The presence of the

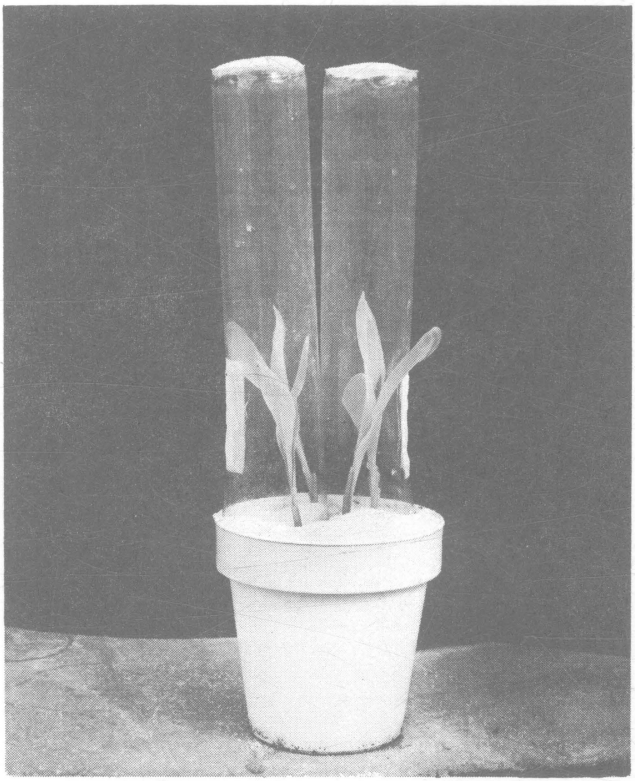

Fig. 1.—Standard tubular plastic cages showing the manner in which they were used to confine aphids on test corn seedlings for transmission studies.

virus in the field plants and the test plants was confirmed by suitable mechanical inoculations of expressed sap from individual plants to healthy corn seedlings. Carborundum powder (600-mesh) was used as an abrasive in making the inoculations. All plants were sprayed with nicotine sulfate to keep them free of insects in the greenhouse. Normal cultural practices were followed. Average temperature of the greenhouse

[4]Insect determinations made by L. M. Russell, Insect Identification and Parasite Introduction Branch, Entomology Research Division, ARS, USDA, Washington 25, D.C.

during the study was 76°F, with a daytime average maximum of 87°F and a night average minimum of 65°F.

Six individual sweet corn plants showing typical symptoms of the virus under investigation, and supporting strong colonies of the corn leaf aphid, *Rhopalosiphum maidis* (Fitch) in their tassels, were selected in the field. Tassels and top leaves with the aphid colonies were removed, placed in paper bags, and transported to the insectary. Five test seedlings were mechanically inoculated, as described above, with sap extracted from each of the field plants and placed in the greenhouse. Then 20 wingless aphids were transferred from each of the six field plants and were caged on each of six test plants. Aphids were allowed to feed on the test seedlings for 3 days, then removed. Plants were then placed in the greenhouse and held for observation. Symptoms of the virus disease developed in some of the aphid test plants in 8 to 14 days. As each test plant showed symptoms, mechanical inoculations were made from it to four test seedlings by using sap extracted from the young center growth.

RESULTS AND CONCLUSIONS

Results of the above two experiments are summarized in Table 1. Infectivity of each field plant was demonstrated. Aphid transmission of the virus from each of the field plants occurred, and the virus was serially recovered mechanically from each plant successfully inoculated by the aphids.

The foregoing experiments show that the corn leaf aphid is a vector of the nonpersistent virus of corn noted in Ohio, and that individual insects of this species can be naturally infective in the field.

TABLE 1.—Transmission of a Nonpersistent Corn Virus in Ohio by Mechanical Inoculation and by the Corn Leaf Aphid, *R. maidis* (Fitch)[1]

Field Plant No.	Mechanical Transmission from Field Source Plants	Transmission by Aphids[2]
1	5/5	3/6
2	5/5	3/6
3	5/5	1/6
4	5/5	3/6
5	5/5	2/6
6	5/5	3/6
Totals	30/30	15/36

[1]Numerators indicate number of test plants infected. Denominators indicate number of plants tested.

[2]The virus developed in all 4 replicates from each of the 15 plants in which mechanical inoculation was successful. Thus, of 60 plants so inoculated, all 60 developed the disease.

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